Calculus Warm Up #2-1

Two different ways:

Find the point on the graph of $y = \frac{1}{3}x + 8$ that is closest to (6, 20).

HW Questions: p. 237

In Exercises 1–6, complete the table using Table 5.1 as a model.

Given	Rewrite	Integrate	Simplify
1. $\int \sqrt[3]{x}\, dx$			

3. $\int \frac{1}{x\sqrt{x}}\, dx$

5. $\int \frac{1}{2x^3}\, dx$

In Exercises 7–26, evaluate the indefinite integral and check your result by differentiation.

7. $\int (x^3 + 2)\, dx$

9. $\int (x^{3/2} + 2x + 1)\, dx$

11. $\int \sqrt[3]{x^2}\, dx$

13. $\int \frac{1}{x^3}\, dx$

15. $\int \frac{1}{4x^2}\, dx$

17. $\int \frac{x^2 + x + 1}{\sqrt{x}}\, dx.$ $= \int \left(\frac{x^2}{x^{1/2}} + \frac{x^1}{x^{1/2}} + \frac{1}{x^{1/2}}\right) dx$

$= \int \left(x^{3/2} + x^{1/2} + x^{-1/2}\right) dx$

19. $\int (x + 1)(3x - 2)\, dx$

In Exercises 7–26, evaluate the indefinite integral and check your result by differentiation.

21. $\int \frac{t^2 + 2}{t^2}\, dt$

23. $\int y^2\sqrt{y}\, dy$

25. $\int 1\, dx$

5.1 - Day 2 Initial Conditions and Particular Solutions

General Solution:

$$y = \int (3x^2 - 1)\, dx = x^3 - x + C$$

Initial condition:

The curve passes through (2, 4).

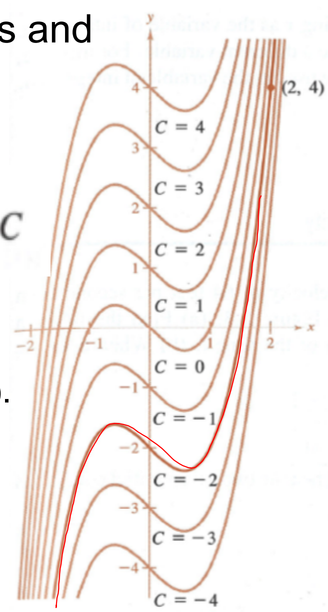
Use it to find C:

$F(x) = x^3 - x + C$

$4 = (2)^3 - 2 + c$

$c = -2$

$$\boxed{f(x) = x^3 - x - 2}$$



$F(x) = x^3 - x + C$

Find the general solution of the equation, then find the particular solution that satisfies the initial condition $\boxed{F(1) = 0}$

$$F'(x) = \frac{1}{x^2} \quad , \quad x > 0$$

$$F(x) = \int x^{-2}\,dx$$

$$= \frac{x^{-1}}{-1} + C$$

$$F(x) = -\frac{1}{x} + C$$

$$0 = -\frac{1}{1} + C$$

$$C = 1$$

$$f(x) = -\frac{1}{x} + 1$$

A ball is thrown upward with an initial velocity of 64 feet per second from an initial height of 80 feet. Find the position equation giving height, s, as a function of time, t. (Assume acceleration due to gravity is - 32 ft/sec^2)

$\boxed{a(t) = -32}$

Given: Two initial conditions

$s(0) = 80$ $\quad$ $s'(0) = 64$

first: $v(t) = \int a(t)\,dt$

$$v(t) = \int -32\,dt$$

$$s'(t) = -32t + C$$

$$64 = -32(0) + C$$

$$s'(t) = -32t + 64$$

$$s(t) = \int (-32t + 64)\,dt$$

S_0

$$s(t) = \frac{-32t^2}{2} + 64t + C$$

$$s(t) = -16t^2 + 64t + 80$$

$$\boxed{s(t) = -16t^2 + v_0 t + s_0}$$

When does the ball hit the ground?

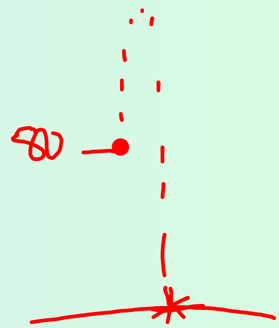
$$s(t) = -16t^2 + 64t + 80$$

$$0 = -16(t^2 - 4t - 5)$$

$$(t-5)(t+1)$$

$$t = 5, -1$$

after 5 sec.



Working backwards, find f(x) given:

$$f''(x) = -20 \qquad f'(1) = 65 \qquad f(6) = 222$$

$$f'(x) = \int -20\,dx$$

$$f'(x) = -20x + C$$

$$65 = -20(1) + C$$

$$C = 85$$

$$f'(x) = -20x + 85$$

$$f(x) = \int (-20x + 85)\,dx$$

$$f(x) = \frac{-20x^2}{2} + 85x + C$$

$$222 = -10(6)^2 + 85(6) + C$$

$$C = 72$$

$$f(x) = -10x^2 + 85x + 72$$

HW:

p. 238 # 27 - 33 odd,

and # 35 - 44

HW Quiz tomorrow:

Polar WS, pgs. 707, 755, 237